

54. (New) The computer readable medium as claimed in claim 38, said computer readable medium further comprising:  
program code means for finding a reference position in the Y axial direction for the tomographic images or the projection images and correcting shift in the Y axial direction on the basis of said reference position.

#### REMARKS

Claims 5, 11, 27, 30 and 39 have been canceled, claims 50 to 54 have been added, and therefore claims 1 to 4, 6 to 10, 12 to 26, 28, 29, 31 to 38, and 40 to 54 are now pending.

Applicants respectfully request reconsideration of the present application in view of this response.

With respect to paragraph one (1) of the Office Action, the specification was objected to because of minor errors at line 17 of page 22, and at line 27 of page 30. The Specification has been corrected as suggested. It is therefore respectfully requested that the objections be withdrawn.

With respect to paragraph two (2), claims 5, 11, 27, 30 and 39 were objected to as being "substantial duplicates" of other claims. Regardless of whether the objections may be disagreed with, to facilitate matters, claims 5, 11, 27, 30 and 39 have been canceled without prejudice. It is therefore respectfully requested that the objections as to these claims be withdrawn.

With respect to paragraph three (3), claims 3 and 33 were objected to as depending from a rejected claim. The Examiner indicated that these claims contain allowable subject matter, and would be allowed if rewritten to include the features of the claims from which they depend. Accordingly, these claims have been rewritten to include all of the features of their original base claims. It is therefore respectfully requested that the objections be withdrawn.

With respect to paragraph five (5), claims 1, 24 and 31 were rejected under 35 U.S.C. § 102(e) as anticipated by Xu et al, U.S. Patent No. 6,363,163.

As regards the anticipation rejection of the claims, to reject a claim under 35 U.S.C. § 102(b), the Office must demonstrate that each and every claim limitation is contained in a single prior art reference. (*See Scripps Clinic & Research Foundation v. Genentech, Inc.*, 18 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 1991)). As explained herein, it is respectfully submitted that the Office Action does not meet this standard, for example, as to the features of the

claims 1, 24 and 31, as explained herein.

Still further, not only must each of the claim limitations be identically described, an anticipatory reference must also enable a person having ordinary skill in the art to practice the claimed invention, namely the claimed subject matter of the claims, as discussed above. (See *Akzo, N.V. v. U.S.I.T.C.*, 1 U.S.P.Q.2d 1241, 1245 (Fed. Cir. 1986)). In particular, it is respectfully submitted that, at least for the reasons discussed herein, the reference relied upon would not enable a person having ordinary skill in the art to practice the subject matter of the claims as presented.

As further regards the anticipation rejections, to the extent that the Office Action relies on the inherency doctrine, it is respectfully submitted that to rely on inherency, the Examiner must provide a "basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristics *necessarily* flows from the teachings of the applied art." (See M.P.E.P. § 2112; emphasis in original; and see *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Int'f. 1990)). Thus, the M.P.E.P. and the case law make clear that simply because a certain result or characteristic may occur in the prior art does not establish the inherency of that result or characteristic. Accordingly, it is respectfully submitted that any anticipation rejection premised on the inherency doctrine must fail absent the foregoing conditions.

The Xu reference purportedly concerns a method to obtain a subtracted section image between current and previous sections, in which section correspondence between the two scans is determined by using curves of relative lung area of the two scans (Fig. 3, column 6, lines 27-52). More particularly, the average section number of each curve is calculated by summing each weighted section number with its corresponding value of the relative lung area. The difference in the average section number between the two scans indicates the overall shifts in the scanning direction (Z-axis) between the two scans. After that, the mid-section and several adjacent sections are selected from the previous scan for comparison, one-by-one, with the mid-section from the current scan to find a pair of the best-matched section images in the two scans (column 6, lines 53-67). After the best-matched section pair is determined, the relative shifts in the vertical and horizontal directions between the previous section image and the corresponding current section image is determined, then, the previous section image is subtracted from the current section image (columns 7 and 8).

In contrast, with the claimed subject matter of each of claims 1, 24 and 31, a shift amount in the Z-axis direction is measured by using first and second (for example, current

and previous) projection images, in which the direction of the projection is perpendicular to the Z-axis (that is, a direction in the X-axis or the Y-axis). Page 20 of the specification and Figs. 1A-2C explain this claim feature. By using the *projection* images of the tomographic slice images, shifts in the Z-axis direction may be determined automatically by performing two-dimensional image comparison by using the template, as provided for in the context of each of claim 1, 24 and 31.

Unlike the system of the Xu reference, it is not necessary to use relative lung area values and it is not necessary to compare slice images one-by-one (this is three-dimensional comparison). The Xu reference may apparently refer to a method of two-dimensional comparison in columns 7 and 8, but this involves comparing two section images, so that this reference does not identically describe (or even suggest) the subject matter of claims 1, 24 or 31, which involves comparing two projection images -- and not section images -- for measuring shifts in the Z-axis direction.

Thus, the Xu reference does not identically describe (or even suggest) anything concerning the use of "projections" as provided for in the context of each of claims 1, 24 and 31. Although the Office Action asserts that the claim 1 feature of "generating a first projection image" corresponds to the reference to "images reconstructed from the two data sets" (column 5, lines 1-7) in the Xu reference, this "reconstruction" merely refers to reconstructing scan image from image data, and is completely different from a "projection" in a "direction perpendicular to Z-axis", as in the claims 1, 24 and 31.

Since the Xu reference does not identically describe (or even suggest) "projection in the direction perpendicular to Z-axis" for measuring shifts as provided for in the context of the claims 1, 24 and 31, it is respectfully submitted that these claims are simply not anticipated by the Xu reference. It is therefore respectfully submitted that claims 1, 24 and 31 are allowable (as are each of their dependent claims).

With respect to paragraph seven (7), claims 2, 4 to 6, 10, 11, 16 to 19, 25 to 30, 32, 34, 38, 39 and 44 to 47 were rejected under 35 U.S.C. § 103(a) as unpatentable over Xu et al, U.S. Patent No. 6,363,163, in view of Some et al., U.S. Patent No. 5,841,148.

As explained above, the primary Xu reference does not describe or suggest the use of a "projection in the direction perpendicular to Z-axis" for measuring shifts (to obtain a pair of the best-matched section images in the two scans). It is therefore respectfully submitted that each of the independent claims are not obvious in view of the Xu reference for essentially the same reasons that claims 1, 24 and 31 are not suggested, as referred to above, since the

secondary Some reference does not cure the critical deficiencies of the primary Xu reference. In this regard, the Office Action only relies on Some for other features and not for the features discussed above that plainly distinguish the Xu reference. It is therefore respectfully submitted that all of the independent claims (and their respective dependent claims) are allowable for essentially the same reasons as claims 1, 24 and 31.

With respect to paragraph eleven (11), claims 7, 8, 12, 35 and 36 were rejected under 35 U.S.C. § 103(a) as unpatentable over Xu et al, U.S. Patent No. 6,363,163, in view of Some et al., U.S. Patent No. 5,841,148, and in further view of Moshfeghi, U.S. Patent No. 5,368,033.

As explained above, the primary Xu reference does not describe or suggest the use of a “projection in the direction perpendicular to Z-axis” for measuring shifts (to obtain a pair of the best-matched section images in the two scans). It is therefore respectfully submitted that each of the independent claims are not obvious in view of the Xu reference for essentially the same reasons that claims 1, 24 and 31 are not suggested, as referred to above, since the secondary Some reference and the third-level Moshfeghi reference do not cure the critical deficiencies of the primary Xu reference. In this regard, the Office Action only relies on Some and Moshfeghi for other features and not for the features discussed above that plainly distinguish the Xu reference. The Moshfeghi reference refers to a projection image for showing vessel overlap and thickness, but it is believed and respectfully submitted that any review of that reference makes plain that it does not describe or suggest using projection images for measuring shifts between current and previous 3D images, for example. It is therefore respectfully submitted that all of the independent claims (and their respective dependent claims) are allowable for essentially the same reasons as claims 1, 24 and 31.

As further regards all of the above obviousness rejections, to reject a claim as obvious under 35 U.S.C. § 103, the prior art must describe or suggest each claim element and it must also provide a motivation or suggestion for combining the elements in the manner contemplated by the claim. (See Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990), cert. denied, 111 S. Ct. 296 (1990); In re Bond, 910 F.2d 831, 834 (Fed. Cir. 1990)). Thus, the “problem confronted by the inventor must be considered in determining whether it would have been obvious to combine the references in order to solve the problem”, Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 679 (Fed. Cir. 1998). The references relied upon simply do not address the problems (referred to in the present application) that are met by the subject matter of any of the rejected claims.

The cases of In re Fine, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988), and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), also make plain that the Office Action's assertions that it would have been obvious to modify the reference relied upon does not properly support a § 103 rejection. It is respectfully suggested that those cases make plain that the Office Action reflects a subjective "obvious to try" standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the references relied upon. In particular, the Court in the case of In re Fine stated that:

Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . . **One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.**

In re Fine, 5 U.S.P.Q.2d at 1600 (citations omitted; emphasis added). Likewise, the Court in the case of In re Jones stated that:

Before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some suggestion for doing so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. . . .

**Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [invention].**

In re Jones, 21 U.S.P.Q.2d at 1943 & 1944 (citations omitted; italics in original).

That is exactly the case here since it is believed and respectfully submitted that the Office Action reflects hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding.

More recently, the Federal Circuit in the case of In re Kotzab has made plain that even if a claim concerns a "technologically simple concept" -- which is not even the case here, there still must be some finding as to the "specific understanding or principle within the knowledge of a skilled artisan" that would motivate a person having no knowledge of the claimed subject matter to "make the combination in the manner claimed", stating that:

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as opposed to multiple sensors controlling multiple valves, is a

technologically simple concept. *With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed.* In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper *prima facie* case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

(See In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Federal Circuit 2000) (italics added)). Here again, it is believed that there have been no such findings to establish that the features discussed above of the rejected claims are met by the reference relied upon. As referred to above, any review of the reference relied upon makes plain that it simply does not describe the features discussed above of the claims as now presented.

Further still, as regards the references relied upon with respect to those claims having means-plus-function language, it is respectfully submitted that it likewise does not describe or even suggest, for example, means for performing at least the recited functions of the claims as discussed above. (See M.P.E.P. §§ 2181 to 2184). In particular, M.P.E.P. § 2182 specifically states that both before and after In re Donaldson Co., 16 F.3d 1189, 29 U.S.P.Q.2d 1845 (Fed. Cir. 1994), applying a reference to a means-plus-function limitation “requires that the [referenced] element perform the *identical function* specified in the claim”, and if that reference teaches identity of function -- which it does not, as essentially explained above with respect to the claims, then an examiner carries the initial burden of proof for showing that the prior art structure is the same as or equivalent to the “structure, material or acts” described in the specification that correspond to the claimed means. (See M.P.E.P. § 2182). Even if the references relied upon did describe the functions of all of the means recited in the claims -- which it does not at least as to the means discussed above, an examiner must still meet his initial proof burden by showing that each of the referenced structures is the same as or equivalent to the structures (and not the functions) described in the specification corresponding to each of the claimed means. (See M.P.E.P. § 2182 and above).

New dependent claims 50 to 54 do not add any new matter and are supported in the specification. It is respectfully submitted that each of these claims is allowable for essentially the same reasons as the claims 10, 26, 29 and 38 from which they respectively depend.

In summary, it is respectfully submitted that claims 1 to 4, 6 to 10, 12 to 26, 28, 29, 31 to 38, and 40 to 54 are allowable at least for the foregoing reasons.

CONCLUSION

In view of all of the above, it is believed that the objections and the rejections have been obviated, and that claims 1 to 4, 6 to 10, 12 to 26, 28, 29, 31 to 38, and 40 to 54 are allowable. It is therefore respectfully requested that the objections and rejections be reconsidered and withdrawn, and that the present application issue as early as possible.

Dated: \_\_\_\_\_

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Respectfully Submitted,

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**AMENDMENT VERSION WITH MARKINGS****IN THE SPECIFICATION:**

Please replace/amend the paragraph beginning at line 12 of page 22 as follows:

The tomographic image external input part 112-3 writes data to the diagnostic image sequence file 112-10. The resolution matching processing part 112-4 reads data from the diagnostic image sequence file 112-10 and the comparison image sequence file 112-11 [112-10]. In addition, the resolution matching processing part 112-4 writes to the correction image sequence file 112-12 of comparison images. The projection image generation processing part 112-5 and the display processing part 112-9 read data from the diagnostic image sequence file 112-10 and the correction image sequence file 112-12 of comparison images.

Please replace/amend the paragraph beginning at line 22 of page 30 as follows:

The tomographic image external input part 312-3 writes data to the diagnostic image sequence file 312-12. The resolution matching processing part 112-4 reads data from the diagnostic image sequence file 312-12 and the comparison image sequence file 312-13 [312-14]. In addition, the resolution matching processing part 312-4 writes in the correction image sequence file 312-14 of comparison images. The shift correction processing part 312-6 corrects shift between the diagnostic image and the comparison image based on the bed position. The projection image generation processing part 312-7 and the display processing part 312-11 read data from the diagnostic image sequence file 312-12 and the correction image sequence file 312-14 of comparison images.

**IN THE CLAIMS:**

Without prejudice, please cancel claims 5, 11, 27, 30 and 39 and please add new claims 50 to 54 as indicated above, and please amend the claims as follows:

1. (Amended) A tomographic image reading method for extracting a comparison image corresponding to a diagnostic image. and displaying the images, said diagnostic image



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being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said method comprising the steps of:

inputting said first tomographic images and said second tomographic images;  
generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template, said template being generated from said first projection image such that said template includes an area in which a specific object image exists;

correcting the slice position according to said shift amount between said first projection image and said second projection image; and

displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

2. (Amended) An image alignment method for extracting a comparison image corresponding to a diagnostic image and displaying the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said method comprising the steps of:

inputting said first tomographic images and said second tomographic images;  
aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are

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different;

generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval, said template being generated from said first projection image such that said template includes an area in which a specific object image exists;

correcting the slice position according to said shift amount between said first projection image and said second projection image; and

displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

3. (Amended) [The image alignment method as claimed in claim 2, further comprising] A tomographic image reading method for extracting a comparison image corresponding to a diagnostic image. and displaying the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said method comprising the steps of:

inputting said first tomographic images and said second tomographic images;

generating a first projection image from said first tomographic images and a second projection image from said second tomographic images;

measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template, said template being generated from said first projection image such that said template includes an area in which a specific object image exists;

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correcting the slice position according to said shift amount between said first projection image and said second projection image;

displaying said diagnostic image and said comparison image at a corrected slice position to a monitor; and

[an adjusting step of] adjusting positions of said diagnostic image and said comparison image which are displayed;

wherein a MIDI signal constructing method is used for the adjusting step, said MIDI signal constructing method comprising the steps of:

providing  $n$  different MIDI channels or control numbers or combinations of them for a signal  $x$  which has  $128 \times n$  stages in which  $n$  is a positive integer;

assuming said MIDI channels or said control numbers or said combinations as  $p=1, 2, \dots, n$ ;

dividing said signal  $x$  into 128 parts  $W(l)$  ( $l; 0 \leq l \leq 127$ ) in ascending order and assigning  $p$  which is equal to  $r+1$  ( $r; 0 \leq l < n$ ) to said signal  $x$  which is equal to  $l \times n + r$ ; and

constructing and sending a MIDI control change message in which a control value is 1 by using a MIDI channel or control number corresponding to  $p$ .

4. (Amended) An image alignment method for extracting a comparison image corresponding to a diagnostic image and displaying the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said method comprising the steps of:

inputting said first tomographic images and said second tomographic images;

aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

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[finding a reference position in the Y axial direction from each of said first tomographic image and said second tomographic image and correcting shift in the Y axial direction on the basis of said reference position;]

generating a first projection image of the X axial direction from said first tomographic images and generating a second projection image of the X axial direction from said second tomographic images;

measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval, said template being generated from said first projection image such that said template includes an area in which a specific object image exists;

correcting the slice position according to said shift amount between said first projection image and said second projection image; and

displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

6. (Amended) A slice image automatic alignment method for extracting a comparison image corresponding to a diagnostic image, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said method comprising the steps of:

inputting said first tomographic images and said second tomographic images;

aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is

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perpendicular to the Z axial direction;

measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval, said template being generated from said first projection image such that said template includes an area in which a specific object image exists; and

correcting the slice position according to said shift amount between said first projection image and said second projection image.

10. (Amended) A slice image automatic alignment method for extracting a comparison image corresponding to a diagnostic image, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said method comprising the steps of:

inputting said first tomographic images and said second tomographic images;

aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

[finding a reference position in the Y axial direction from each of said first tomographic image and said second tomographic image and correcting shift in the Y axial direction on the basis of said reference position;]

generating a first projection image of the X axial direction from said first tomographic images and generating a second projection image of the X axial direction from said second tomographic images;

measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval,

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said template being generated from said first projection image such that said template includes an area in which a specific object image exists; and

correcting the slice position according to said shift amount between said first projection image and said second projection image.

24. (Amended) A tomographic image reading apparatus for extracting a comparison image corresponding to a diagnostic image and displaying the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said apparatus comprising:

inputting means for inputting said first tomographic images and said second tomographic images;

projection image generation means for generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

template generation means for generating a template from said first projection image such that said template includes an area in which a specific object image exists;

matching means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as said template;

slice position correcting means for correcting the slice position according to said shift amount between said first projection image and said second projection image; and

displaying means for displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

25. (Amended) An image alignment apparatus for extracting a comparison image

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corresponding to a diagnostic image and displaying the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said apparatus comprising:

inputting means for inputting said first tomographic images and said second tomographic images;

resolution aligning means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

projection image generation means for generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

template generation means for generating a template from said first projection image such that said template includes an area in which a specific object image exists;

matching means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as said template by performing pattern matching while shifting said template by an interval;

slice position correcting means for correcting the slice position according to said shift amount between said first projection image and said second projection image; and

displaying means for displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

26. (Amended) An image alignment apparatus for extracting a comparison image corresponding to a diagnostic image and displaying the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice

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image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said apparatus comprising:

inputting means for inputting said first tomographic images and said second tomographic images;

resolution aligning means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

[reference position recognition means for finding a reference position in the Y axial direction from each of said first tomographic image and said second tomographic image

shift correcting means for correcting shift in the Y axial direction on the basis of said reference position;]

projection image generation means for generating a first projection image of the X axial direction from said first tomographic images and generating a second projection image of the X axial direction from said second tomographic images;

template generation means for generating a template from said first projection image such that said template includes an area in which a specific object image exists;

matching means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as said template by performing pattern matching while shifting said template by an interval;

slice position correcting means for correcting the slice position according to said shift amount between said first projection image and said second projection image; and

displaying means for displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

28. (Amended) A slice image automatic alignment apparatus for extracting a



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comparison image corresponding to a diagnostic image, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said apparatus comprising:

inputting means for inputting said first tomographic images and said second tomographic images;

resolution aligning means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

projection image generation means for generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

template generation means for generating a template from said first projection image such that said template includes an area in which a specific object image exists;

matching means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as said template by performing pattern matching while shifting said template by an interval; and

slice position correcting means for correcting the slice position according to said shift amount between said first projection image and said second projection image.

29. (Amended) A slice image automatic alignment apparatus for extracting a comparison image corresponding to a diagnostic image, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y

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axial direction and body axis being in the Z axial direction, said apparatus comprising:

inputting means for inputting said first tomographic images and said second tomographic images;

resolution aligning means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

[reference position recognition means for finding a reference position in the Y axial direction from each of said first tomographic image and said second tomographic image;

shift correcting means for correcting shift in the Y axial direction on the basis of said reference position;]

projection image generation means for generating a first projection image of the X axial direction from said first tomographic images and generating a second projection image of the X axial direction from said second tomographic images;

template generation means for generating a template from said first projection image such that said template includes an area in which a specific object image exists;

matching means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as said template by performing pattern matching while shifting said template by an interval; and

slice position correcting means for correcting the slice position according to said shift amount between said first projection image and said second projection image.

31. (Amended) A computer readable medium storing program code for causing a computer to extract a comparison image corresponding to a diagnostic image and to display the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images

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are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said computer readable medium comprising:

program code means for inputting said first tomographic images and said second tomographic images;

program code means for generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

program code means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template, said template being generated from said first projection image such that said template includes an area in which a specific object image exists;

program code means for correcting the slice position according to said shift amount between said first projection image and said second projection image; and

program code means for displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

32. (Amended) A computer readable medium storing program code for causing a computer to extract a comparison image corresponding to a diagnostic image and to display the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said computer readable medium comprising:

program code means for inputting said first tomographic images and said second tomographic images;

program code means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

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program code means for generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

program code means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval, said template being generated from said first projection image such that said template includes an area in which a specific object image exists;

program code means for correcting the slice position according to said shift amount between said first projection image and said second projection image; and

program code means for displaying said diagnostic image and said comparison image at a corrected slice position to a monitor.

33. (Amended) [The computer readable medium as claimed in claim 32, further comprising] A computer readable medium storing program code for causing a computer to extract a comparison image corresponding to a diagnostic image and to display the images, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said computer readable medium comprising:

program code means for inputting said first tomographic images and said second tomographic images;

program code means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

program code means for generating a first projection image from said first tomographic images and a second projection image from said second tomographic images;

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program code means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval, said template being generated from said first projection image such that said template includes an area in which a specific object image exists;

program code means for correcting the slice position according to said shift amount between said first projection image and said second projection image;

program code means for displaying said diagnostic image and said comparison image at a corrected slice position to a monitor; and

adjusting program code means for adjusting positions of said diagnostic image and said comparison image which are displayed;

wherein a MIDI signal constructing program code means is used for adjusting program code means, said MIDI signal constructing program code means including:

program code means for providing n different MIDI channels or control numbers or combinations of them for a signal x which has  $128 \times n$  stages in which n is a positive integer;

program code means for assuming said MIDI channels or said control numbers or said combinations as  $p=1, 2, \dots, n$ ;

program code means for dividing said signal x into 128 parts  $W(l)$  ( $l; 0 \leq l \leq 127$ ) in ascending order and assigning p which is equal to  $r+1$  ( $r; 0 \leq r < n$ ) to said signal x which is equal to  $l \times n + r$ ; and

program code means for constructing and sending a MIDI control change message in which a control value is 1 by using a MIDI channel or control number corresponding to p.

34. (Amended) A computer readable medium storing program code for causing a computer to extract a comparison image corresponding to a diagnostic image, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a

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slice plane in the X-Y axial direction and body axis being in the Z axial direction, said computer readable medium comprising:

program code means for inputting said first tomographic images and said second tomographic images;

program code means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

program code means for generating a first projection image from said first tomographic images and a second projection image from said second tomographic images, wherein the direction of projection for generating each of said first and second projection images is perpendicular to the Z axial direction;

program code mean for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval, said template being generated from said first projection image such that said template includes an area in which a specific object image exists; and

program code means for correcting the slice position according to said shift amount between said first projection image and said second projection image.

38. (Amended) A computer readable medium storing program code for causing a computer to extract a comparison image corresponding to a diagnostic image, said diagnostic image being a slice image which is one of first tomographic images, said comparison image being a slice image which is one of second tomographic images which are taken at the time different from the time when the first tomographic images are taken, body section being a slice plane in the X-Y axial direction and body axis being in the Z axial direction, said computer readable medium comprising:

program code means for inputting said first tomographic images and said second tomographic images;

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program code means for aligning resolutions of said first tomographic images and said second tomographic images by scaling one or both of said tomographic images when the resolutions of said first tomographic images and said second tomographic images are different;

[program code means for finding a reference position in the Y axial direction from each of said first tomographic image and said second tomographic image and correcting shift in the Y axial direction on the basis of said reference position;]

program code means for generating a first projection image of the X axial direction from said first tomographic images and generating a second projection image of the X axial direction from said second tomographic images;

program code means for measuring shift amount between said first projection image and said second projection image by searching said second projection image for the same area as a template by performing pattern matching while shifting said template by an interval, said template being generated from said first projection image such that said template includes an area in which a specific object image exists; and

program code means for correcting the slice position according to said shift amount between said first projection image and said second projection image.